MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

ECP2046 – COMPUTER ORGANIZATION AND ARCHITECTURE

(TE, RE)

28 FEBRUARY 2020
3.00 p.m – 5.00 p.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 3 pages excluding cover page with 4 questions only.

2. Attempt ALL 4 questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the answer booklet provided.

QUESTION 1

a) For the 4-bit signed magnitude numbers given below, perform the required arithmetic operations in 8-bit two's complement format

$$K = 1101_2$$
$$L = 0101_2$$
$$M = 1010_2$$

i) K – L

ii) –(M+L+K)

[5+6 marks]

b) Find the corresponding decimal number for the following IEEE-32 bit floating-point numbers with 8-bit biased exponent.

i) 0 10000111 10000000000000000000000

ii) 1 01111010 00000000000000000000000

[5+5 marks]

c) Perform the following addition of two decimal numbers; (-3) and (-6), in two's complement representation with length of 4 bits. Indicate if an overflow has occurred.

(-3) + (-6)

[4 marks]

Continued .....

QUESTION 2

a) The address field or fields of a typical instruction are relatively small. There are variety of addressing modes that had been employed so that large range of locations can be addressed.

i. Compare direct and indirect addressing modes including how the effective address is determined [2+2 marks]

ii. The advantage of each mode [1+1 marks]

iii. The disadvantage of each mode. [1+1 marks]

b) The registers in the processor can be broadly divided into two categories. Name these categories and elaborate on the general roles of the registers belonging to each of the categories.

[4 marks]

c) Explain the factors that affect the design of instruction set of a processor.

[10 marks]

d) Given the initial values (in decimal) in the registers and assembly code as follow:
A=11, B=6, C=2, D=4, E=9

Instruction 1 (I1):	MOV X, A
Instruction 2 (I2):	ADD X, B
Instruction 3 (I3):	MOV Y, D
Instruction 4 (I4):	MUL Y, E
Instruction 5 (I5):	SUB Y, C
Instruction 6 (I6):	DIV Y, X

i) Determine the number of address of I4

ii) Determine the value of register X after I2 and before I3 in decimal

iii) Determine the value of register Y after I6 in decimal

[1+1+1 marks]

Continued .....

QUESTION 3

a) Draw a block diagram of a control unit.

[5 marks]

b) List down and briefly explain the inputs and outputs of a control unit.

[12 marks]

c) Discuss the principle of hardwired and microprogrammed control unit, highlight the advantages and disadvantages of each implementation.

[2+3+3 marks]

QUESTION 4

a) With the aid of a diagram, explain the differences between pipeline, superpipeline and superscalar techniques.

[11 marks]

b) Evaluate the effect of each technique below in improving the computer performance.
   i) Branch prediction
   ii) Data flow analysis
   iii) Speculative execution

[3+3+3 marks]

c) i) What is instruction issue policy?

[2 marks]

ii) State three types of instruction issue policies.

[3 marks]

End of Paper